

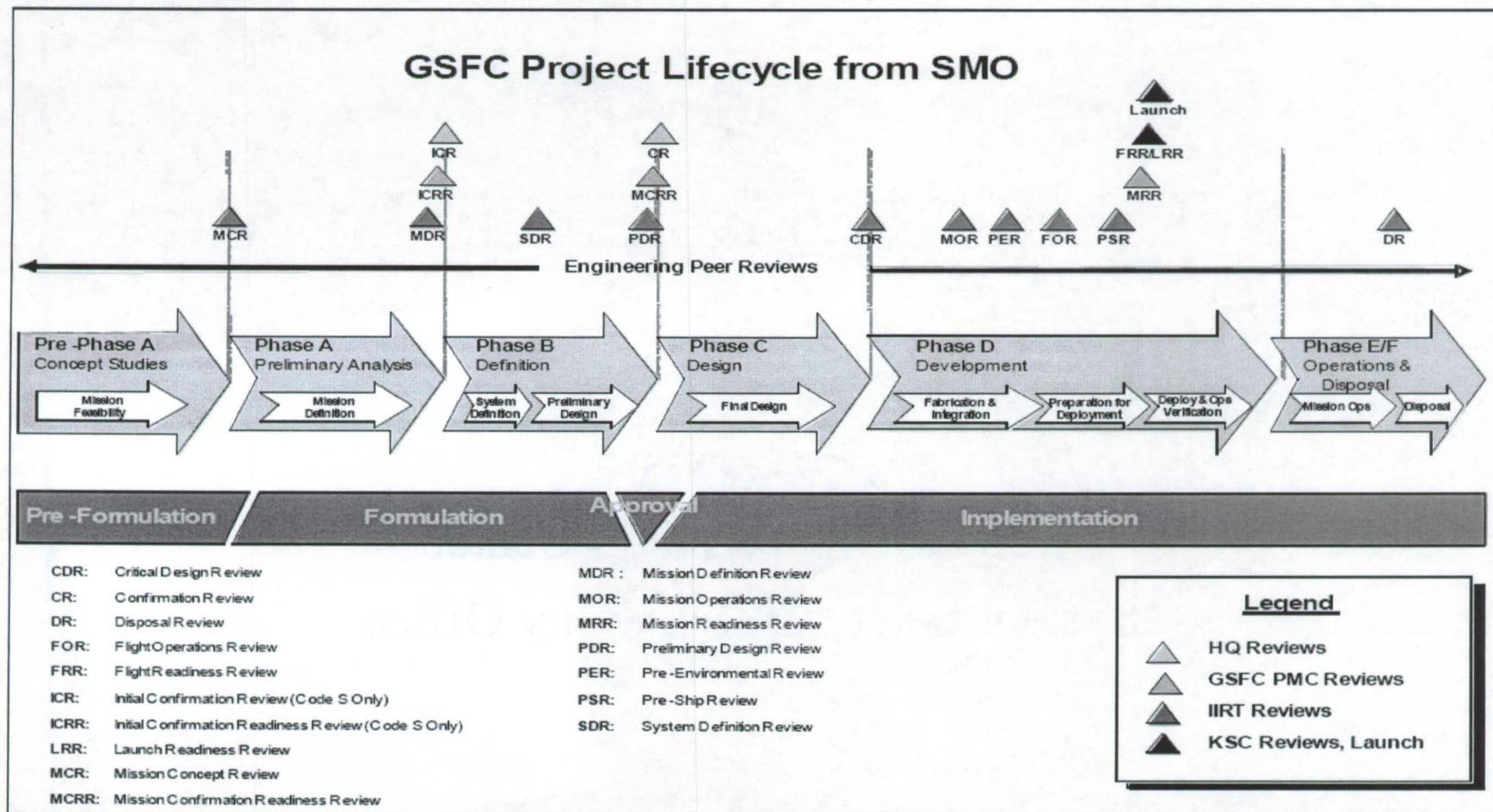
# GSFC ELV Payload Safety Process

Bo Lewis

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System Safety & Reliability Office

# Typical GSFC Project Lifecycle



Rev. - 8/9/04



# GSFC Safety Effort Throughout Project Lifecycle



- Proposal Support
- Requirements Definition
- Design Assessment
- Identification of Hazards
- Recommended Hazard Controls
- Assessment of Risk
- Verification of Hazard Controls
- Development of Safety Data Packages
- Interface with KSC & Range Safety
- Safety Support during I&T Activities
- Track Closure of Verification Items
- Safety Certification

# Pre-Phase A & Phase A Safety Activities



- Proposal Support
  - New Business Committee
  - IMDC (Integrated Mission Design Center)
  - Trade-off Studies
  - Source Evaluation Boards
  - Rapid Spacecraft Development Office (RSDO)
- Negotiate Funding Needs
- Requirements Definition
  - AFSPCMAN 91-710 (replaced EWR 127-1)
  - KNPR 8715.3 (replaced KHB 1710.2)
  - Safety inputs to Mission Assurance Requirements (MAR) document
  - System Safety Program Plan



# Phase B Safety Activities

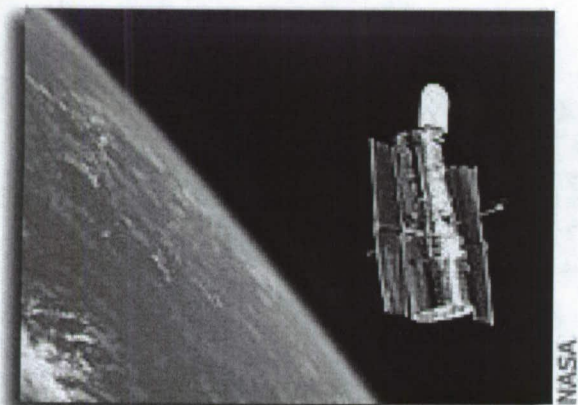


- Preliminary Interface with Range Safety
- Identification of Hazards & Recommended Hazard Controls
  - Preliminary Hazard Analysis (PHA)
  - Safety Assessment Reports (SARs)
    - Instruments, Subsystems, etc.
  - Preliminary Missile System Prelaunch Safety Package (MSPSP)
    - AFSPCMAN 91-710 Vol. 3 Attachment 1 contains guidance on what is required
    - Chapter 3 Design Compliance Checklist also required
- Preliminary Design Assessment
  - To support PDR
- Range Safety Requirements Tailoring

# Some GSFC Projects



HST

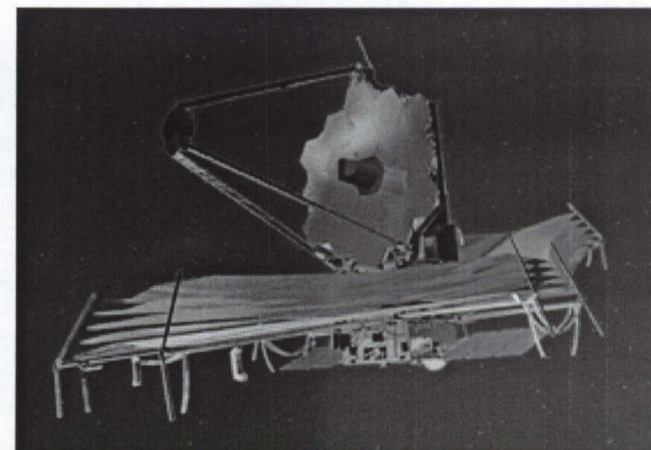


GLAST

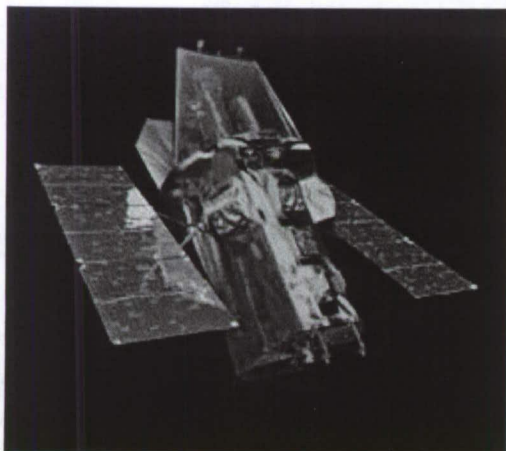


Credit: Hytec

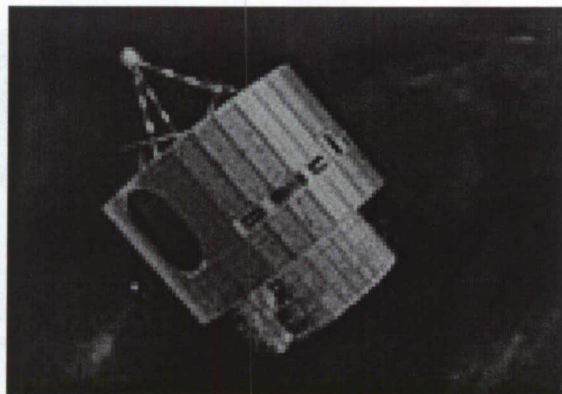
JWST



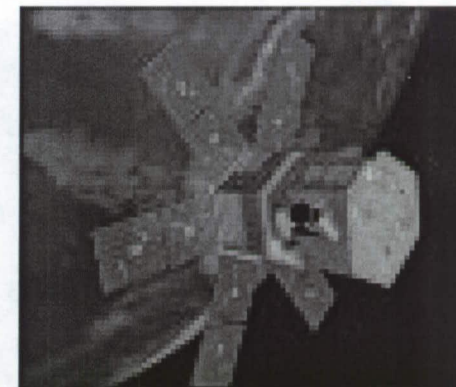
SWIFT



GOES



SORCE



November 16-18, 2004

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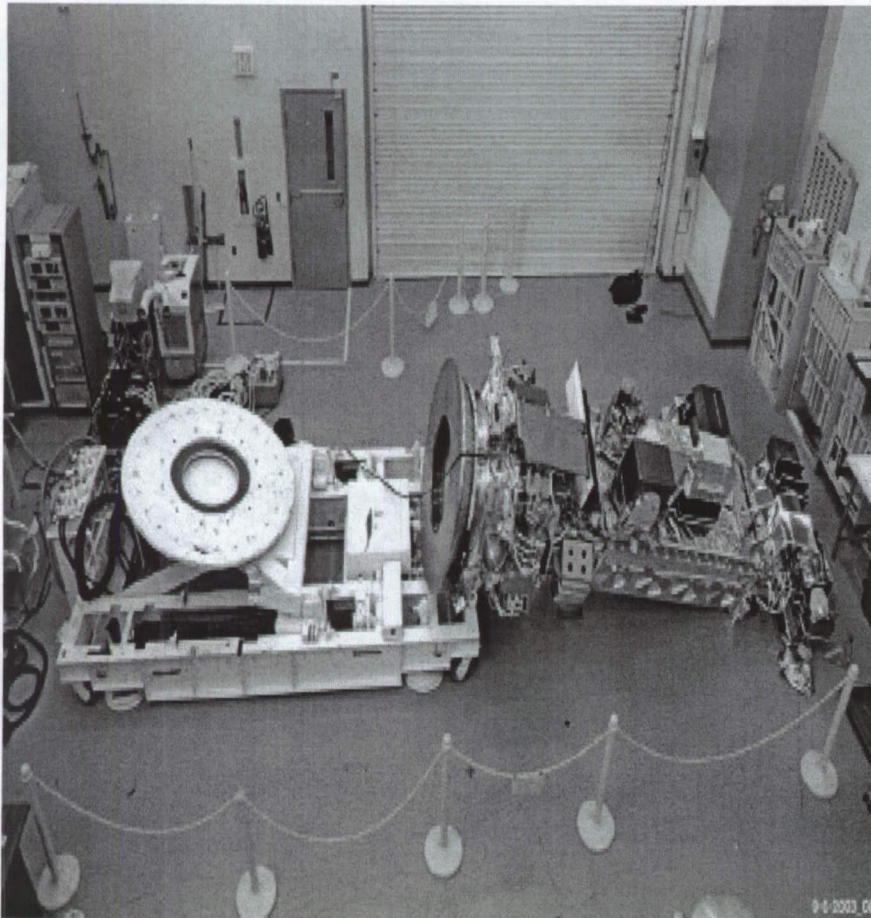
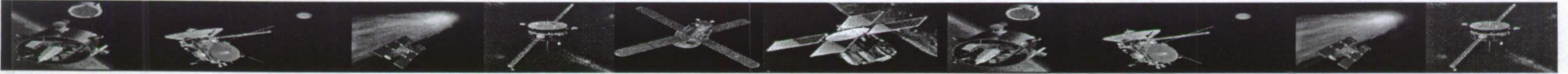
# Phase C Safety Activities



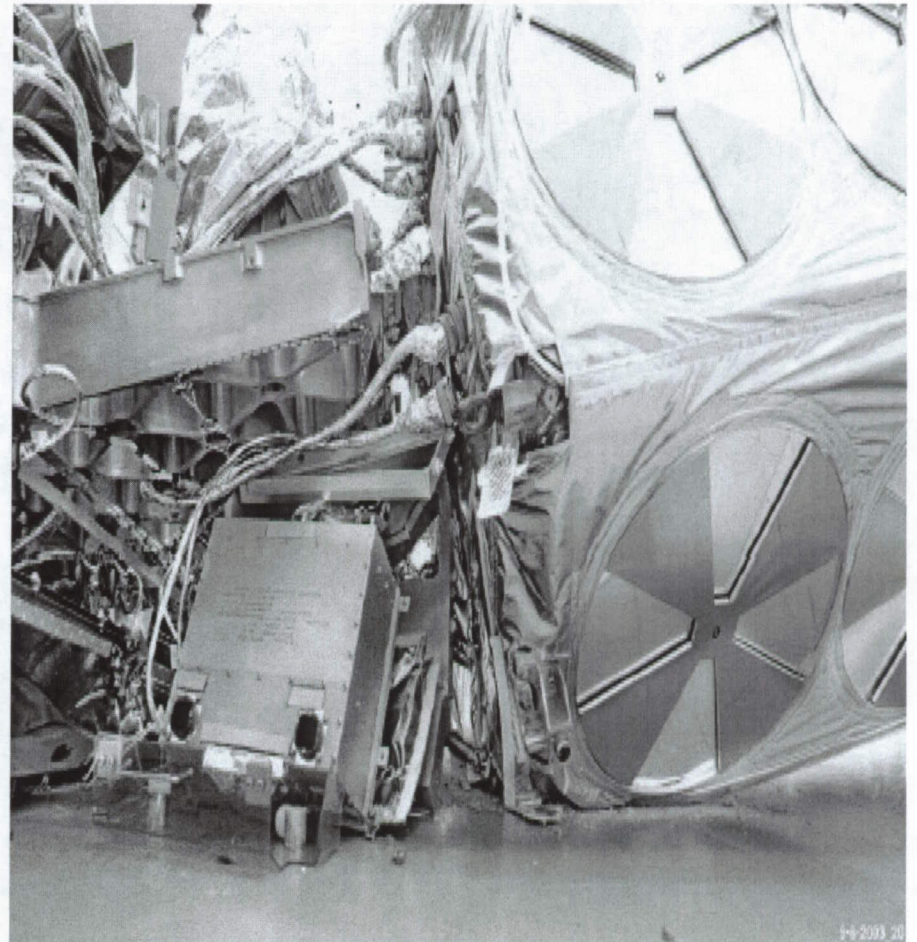
- Updated Hazard Assessments
  - Subsystem/System Hazard Analysis
  - Updated SARs
  - Intermediate MSPSP
- Design Assessment
  - To support CDR



# NOAA N' Accident



9-4-2003, 08



9-4-2003, 20

November 16-18, 2004

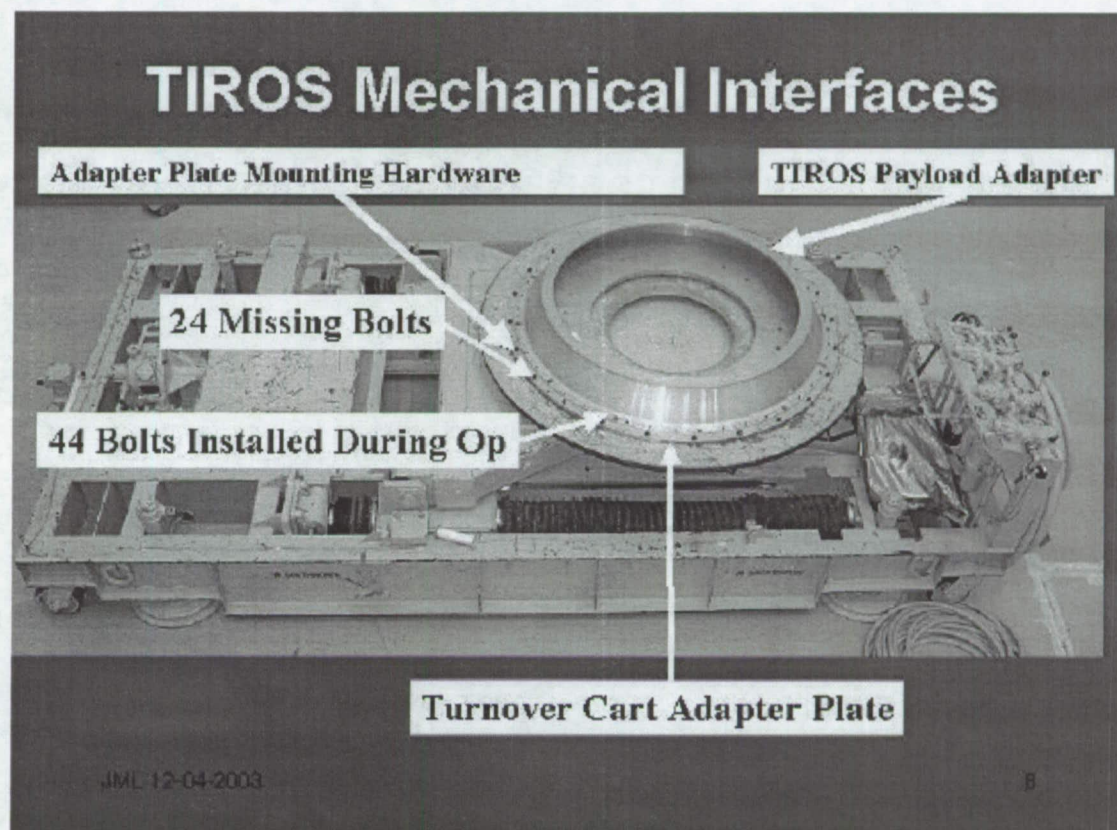
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# NOAA N' MIB Findings



- **Proximate Cause:** The NOAA N-PRIME satellite fell because the LMSSC operations team failed to follow procedures to properly configure the TOC, such that the 24 bolts that were needed to secure the TOC adapter plate to the TOC were not installed



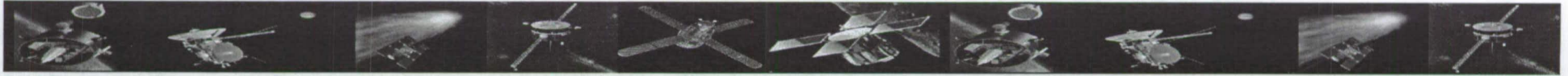
# NOAA-N' MIB Root Causes



- The TOC adapter plate was not secured to the TOC because the LMSSC operations team failed to execute their satellite handling procedures.
- The LMSSC operations team's lack of discipline in following procedures evolved from complacent attitudes toward routine spacecraft handling, poor communication and coordination among operations team, and poorly written or modified procedures.
- The preconditions within integration and test (I&T) operations described above existed because of unsafe supervision practices within the LMSSC project organization, including ad hoc planning of operations, inadequate oversight, failure to correct known problems, and supervisory violations.



# NOAA-N' MIB Root Causes



- The unsafe supervision practices within the TIROS program had their roots in the LMSSC organization: the inadequate resources and emphasis provided for safety and quality assurance functions; the unhealthy mix of a dynamic I&T climate with a well-established program and routine operations; and the lack of standard, effective process guidelines and safeguards for operations all negatively influenced the project team and activities.
- The in-plant government representation, Defense Contract Management Agency (DCMA), and the GSFC Quality Assurance (QA)/safety function failed to provide adequate oversight to identify and correct deficiencies in LMSSC operational processes, and thus failed to address or prevent the conditions that allowed the mishap to occur.
- The Government's inability to identify and correct deficiencies in the TIROS operations and LMSSC oversight processes were due to inadequate resource management, an unhealthy organizational climate, and the lack of effective oversight processes.

# Phase D Safety Activities



- Safety Support during I&T Activities
  - Operational Hazard Analysis (OHA)
  - Procedures and Work Orders
  - Safety monitoring of hazardous activities
  - Audits
- Support GOWGs & other Range Safety meetings
- Generate final MSPSP
  - Submit to Range Safety for review & approval at least 45 calendar days before shipment of hardware to the range.
- Range Safety required forms
  - Plastics usage
  - RF



# Phase D Safety Activities



- Track Closure of Verification Items
  - Any verification items not closed in Final MSPSP are tracked via VTL
- GSFC Safety Certification Required Before Ship to Launch Site
  - All safety requirements are met and payload is safe for shipment to launch site and integration & test
- On-site Safety Support at Launch Site
  - Hazardous procedure review
  - Safety monitoring of hazardous operations